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THE KANSAS FOREST TREES IDENTIFIED BY LEAVES AND FRUIT.

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The artificial Key here given is for the rapid identification of the genera in the following list. Where there are several representatives under any genus, a second key has been given, by means of which the species may be readily determined. The short descriptions added will doubtless be found quite sufficient to verify the correctness of the identification. We have made use of such characters in the preparation of the keys as are most obvious, and by which the determination can be satisfactorily made during the growing season. The leaves have furnished most of these characters, but we have made use of others, as of the branches, trunks, and fruits, where satisfactory identification could not otherwise be made. The flowers, when conspicuous, are generally mentioned in the descriptions. The characters as given by Gray and other authors, we have made free use of, yet we have had at the same time the specimens before us in nearly all cases. The characterization of the wood is taken from Sargent's Report on the Forest Trees of North America.

This same authority has been followed in the nomenclature and arrangement of the genera and species. We have made his statements as to the geographical distribution the basis for the preparation of our list. A few trees have been given which have been as yet doubtfully or perhaps not at all actually found within the limits of the State, but have been detected in neighboring States. The eastern species of catalpa (*C. bignonioides*) is so generally and abundantly cultivated with our western form (*C. speciosa*) that we have included it in the list. A few of the species given may be only shrubby in this State, but we have thought best to include them. Perhaps it would be well, also, to reproduce Prof. Sargent's distinction between trees and shrubs, given in the Catalogue of Forest Trees, which is as follows:

"Species which grow from the ground with a single stem, either wholly or over a large portion of the area of their distribution, are admitted into the following catalogue without reference to the height or size they may attain."

The signs of degrees (°) and of minutes (') are used in the descriptions for feet and inches, respectively.

KEY TO THE GENERA.

Lvs. deciduous, trees not cone-bearing (1).

Lvs. evergreen, needle-shaped or scale-like (47).

1. Lvs. simple (2).
1. Lvs. compound (36).
 2. Lvs. alternate (3).
 2. Lvs. opposite, or verticillate (34).
3. Lvs. entire (4).
3. Lvs. serrate, dentate, cut-toothed or lobed (9).
 4. Branches more or less spiny or thorny (5).
 4. Branches free from spines or thorns (6).
5. Lvs. nearly smooth, wedge-oblong, or oval-lanceolate; fr. cherry-like.....**21** (Bumelia.)
5. Lvs. shining above, strongly veined beneath, ovate or ovate-oblong, fr. orange-like.....**29** (Maclura.)
6. Lvs. broadly-ovate-cordate, 3'-4' long, 4'-5' wide.....**16** (Cercis.)
6. Lvs. not as above (7).
7. Lvs. obovate-lanceolate, 6'-12' long, pointed; fr. 3'-4' long..... **1** (Asimina.)
7. Lvs. lanceolate-oblong, shining above, downy beneath; fr. an acorn.....**33** (Quercus.)
7. Lvs. ovate or ovate-oblong; fr. globular, $\frac{1}{4}$ -1' in diameter (8).
 8. Lvs. ovate, bark spicy, aromatic; twigs and foliage mucilaginous.....**25** (Sassafras.)
 8. Lvs. ovate oblong, thickish, bark astringent; fr. edible when ripe.....**22** (Diospyros.)
9. Trunk or branches armed with thorns or spines (10).
9. Trunk and branches unarmed (14).
 10. Lvs. very obscurely denticulate; fr. large, orange-like.....**29** (Maclura.)
 10. Lvs. plainly serrate, cut or toothed; fr. small or medium (11).
11. Lvs. finely serrulate, or serrate above the middle (12).
11. Lvs. coarsely or sharply serrate, cut or toothed (13).
 12. Lvs. obovate and oblanceolate, serrate above the middle; thorns 2'-3' long.....**19** (Crataegus.)
 12. Lvs. nearly lanceolate, finely serrulate, thorns not prominent.....**17** (Prunus.)
13. Lvs. coarsely or doubly serrate, conspicuously pointed, ovate.....**17** (Prunus.)
13. Lvs. sharply cut or toothed, roundish-ovate, ovate-oblong or obovate**19** (Crataegus.)
14. Bark white, detached (at least on the branches) annually in thin plates, lvs. broad, palmately lobed.....**30** (Platanus.)
14. Bark, &c., not as above (15).
15. Trees small, sometimes only shrubs (16).
15. Trees large, bark more or less furrowed or laminated (23).
 16. Lvs. large, sometimes 3-lobed; twigs yellowish green, bark spicy.**25** (Sassafras.)
 16. Lvs. &c., not as above (17).
17. Lvs. mostly narrow elongated, leaf-like stipules deciduous, fr. a 1-celled pod.....**37** (Salix.)
17. Lvs. and fr. not as above (18).
 18. Lvs. obtusely or obscurely serrate or crenate-serrate (19.)
 18. Lvs. sharply serrate, cut or toothed (20.)
19. Lvs. oblong-oval, parallel veins prominent, fr. purple, berry-like..... **7** (Rhamnus.)
19. Lvs. obovate, downy on the midrib beneath, fr. a red, berry-like drupe..... **5** (Ilex.)
19. Lvs. oblong or lanceolate, scarcely veiny, fr. greenish, acerb.....**18** (Pyrus.)
 20. Lvs. downy or somewhat pubescent; straight-veined, fr. a nut or hop-like (21.)
 20. Lvs. glabrous, at least when mature; fr. an apple, or berry-like (22).
21. Bark brownish furrowed; fr. hop-like in appearance.....**34** (Ostrya.)
21. Bark close, smooth, gray; fr. a nut with halberd-shaped bracts.....**35** (Carpinus.)
22. Fr. purplish, sweet, ripe in June; lvs. oblong-ovate, 2'-3' long, acuminate.....**20** (Amelanchier.)
22. Fr. greenish, acerb; lvs. ovate or lanceolate.....**18** (Pyrus.)
23. Lvs. broadly sub-cordate, often truncate at base or deltoid (24).
23. Lvs. not as above (25).
 24. Lvs. serrate with incurved teeth; buds covered with varnish.....**38** (Populus.)
 24. Teeth not incurved, inner bark easily peeled off; buds unvarnished..... **2** (Tilia.)
25. Lvs. linear, lanceolate or ovate-lanceolate, stipules often conspicuous.....**37** (Salix.)
25. Lvs. varying; not as above (26).
 26. Lvs. lobed (27).
 26. Lvs. serrate (28).
27. Fr. an acorn, bark with much tannin**33** (Quercus.)
27. Fr. a drupe; twigs yellowish-green, bark spicy aromatic.....**25** (Sassafras.)
27. Fr. blackberry-like; lvs. rough above, lobed only on young shoots.....**28** (Morus.)

28. Lvs. with very large sinuate teeth; fr. an acorn.....**33** (*Quercus*).
 28. Lvs., etc., not as above (29).
29. Lvs. smooth and shining above, serrate, with incurved teeth; raceme of white
 fls. in May.....**17** (*Prunus*).
 29. Lvs., etc., not as above (30).
30. Lvs. rhombic-ovate, whitish beneath, twigs reddish, bark brownish, some-
 what laminate.....**36** (*Betula*).
 30. Lvs., etc., not as above (31).
31. Bark smooth, close, gray; fr. a nut, with halberd-lobed bracts.....**35** (*Carpinus*).
 31. Bark, etc., not as above (32).
32. Bark brownish, furrowed, with fine, narrow longitudinal divisions; fr.
 hop-like.....**34** (*Ostrya*).
 32. Bark coarse, branches sometimes corky-winged; fr. a drupe or samara (33).
33. Veins from the midrib straight and parallel, *veinlets obscure*; fr. a samara.....**26** (*Ulmus*).
 33. Veins from the midrib irregular; *veinlets prominent*; fr. a small drupe.....**27** (*Celtis*).
 34. Lvs. subentire or serrate; fr. a pod (35).
34. Lvs. palmately lobed; fr. a samara.....**10** (*Acer*).
 35. Lvs. oval-oblong, serrate, 2'-5' long, pod deeply lobed, crimson.....**6** (*Euonymus*).
 35. Lvs. cordate, subentire, often verticillate, 1° long, pod long cylindric.....**24** (*Catalpa*).
 36. Lvs. palmately compound, lfts. 5-7.....**8** (*Æsculus*).
 36. Lvs. ternate, pinnate, or bi-pinnate (37).
37. Trunk or branches armed with spines, thorns or prickles (38).
 37. Trunk and branches unarmed (40).
38. Lfts. 4-5 pairs; bark, lvs. and fleshy pod very pungent and aromatic..... **3** (*Zanthoxylum*).
 38. Lfts. 6-12 pairs; bark, etc. not pungent or aromatic (39).
39. Lfts. lanceolate-oblong; thorns stout, often triple; pods 12'-18' long, often twisted, **15** (*Gleditschia*).
 39. Lfts. ovate or oblong; branches armed with stipular prickles: pods 4'-6' long.....**13** (*Robinia*).
 40. Lvs. bi-pinnate, 1°-3° long; pod 6'-10' long; bean hard, brown, smooth.....**14** (*Gymnocladus*).
 40. Lvs. pinnate or ternate; fr. a samara or nut (41).
41. Lvs. opposite (42).
 41. Lvs. alternate (43).
42. Lfts. 3-5; wood light, soft; twigs light green; fr. a double samara.....**11** (*Negundo*).
 42. Lfts. 5-9; wood heavy, tough; bark furrowed; fr. a samara.....**23** (*Fraxinus*).
 43. Lfts. 3; fr. winged; tree small.....**4** (*Ptelea*).
 43. Lfts. 5-many (44).
44. Tree small; fr. a small, dry drupe or a berry (45).
 44. Tree large; bark rough; fr. a walnut or hickory-nut (46).
45. Lvs. odd-pinnate; fr. a small, dry drupe, red or whitish.....**12** (*Rhus*).
 45. Lvs. abruptly pinnate; fr. a single or triple berry.....**9** (*Sapindus*).
 46. Buds superposed, uppermost far above the axil; pith in plates; fr. a walnut, **31** (*Juglans*).
 46. Buds scaly, axillary; pith continuous; fr. a hickory-nut.....**32** (*Carya*).
 47. Lvs. needle-shaped, 3'-5' long, 2 or 3 in a fascicle; fr. a cone.....**40** (*Pinus*).
 47. Lvs. scale-shape, acute; fr. a bluish berry.....**39** (*Juniperus*).

LIST OF TREES.

(Order Anonaceæ.)

1. ASIMINA. PAPAW.

1. *A. triloba*, Dunal; Papaw. A small tree; wood light, soft, yellowish-green; lvs. 8'-12' long, at first rusty downy, soon glabrous; fls. in early spring, dull purple; fr. 3'-4' long, ripe in autumn.

(Order Tiliaceæ.)

2. TILIA. BASSWOOD.

2. *T. Americana*, L.; Basswood, American Linden. A large tree, with light, soft wood; inner bark very strong; lvs. smooth and green on both sides, serrate, often truncate at base. The cluster of fragrant fls. with a peduncle that is a leaf-like bract.

(Order Rutaceæ.)

3. ZANTHOXYLUM. PRICKLY ASH.

3. *Z. Americanum*, Miller; Prickly Ash. A small tree, often reduced to a shrub;

bark, lvs. and pods bitter and aromatic; lfts. 9-11; fls. in axillary clusters, preceding the lvs. in spring; stems, and often leaf-stalks, prickly.

4. PTELEA. WAFER ASH.

4. *P. trifoliata*, L.; Hoptree, Wafer Ash. A small tree, often only a shrub; lvs. 3-foliate; lfts. sessile, ovate, pointed; small greenish-white fls. The bitter fruit winged all around, nearly 1' in diameter.

(Order Aquifoliaceæ.)

5. ILEX. HOLLY.

5. *I. decidua*, Walter; Holly. A tree or tall, straggling shrub; wood hard, creamy white; lvs. simple, alternate, downy on the midrib, shining above, acute or acuminate at each end. Small fls. in spring; fr. a red drupe.

(Order Celastraceæ.)

6. EUONYMUS. BURNING BUSH.

6. *E. atropurpureus*, Jacq.; Burning Bush, Wahoo. Small tree, often a low shrub; wood heavy, tinged with orange; lvs. opposite, serrate, pointed; branchlets 4-sided; pods deeply lobed, bright crimson in autumn.

(Order Rhamnaceæ.)

7. RHAMNUS.

7. *R. Caroliniana*, Walter; Indian Cherry. Small tree; wood light brown, hard; lvs. alternate (rarely opposite), oblong-oval, dark shining green above; veins prominent, nearly straight, parallel. Fr. a black, berry-like drupe.

(Order Sapindaceæ.)

8. ÆSCULUS. BUCKEYE.

8. *A. glabra*, Willd.; Ohio Buckeye, Fetid Buckeye. Small tree, with light, soft wood. Lfts. 5; fls. in May or June; stamens curved, exserted; fr. covered with prickles when young.
9. *A. flava*, Ait.; Sweet Buckeye. Tree and wood similar to preceding. Lfts. 5-7; fls. in late spring; stamens included; fr. smooth.

9. SAPINDUS. SOAPBERRY.

10. *S. marginatus*, Willd.; Soapberry, Wild China. A tree 20°-50° high. Lfts. 9-18, ovate-lanceolate, long-pointed, entire. Berry usually single, reddish-brown; pulp soapy.

(Order Aceraceæ.)

10. ACER. MAPLE.

11. *A. saccharinum*, Wang; Sugar Maple. A large tree; bark light gray; wood heavy, hard, tough, close-grained; lvs. 3-5-lobed, whitish beneath, sinuses rounded; fls. appearing with the lvs.; fr. broad.
12. *A. dasycarpum*, Ehrh.; Soft, White, or Silver Maple. A large tree; wood light, hard, brittle, close-grained. Lvs. very deeply 5-lobed, silvery-white underneath, the divisions narrow, cut-lobed and toothed; fls. preceding the lvs.; fr. woolly when young.
13. *A. rubrum*, L.; Red Maple. Large tree, wood heavy, hard, not strong, compact; twigs reddish; lvs. 3-5-lobed, whitish underneath, the lobes serrate and notched; fls. preceding the lvs.; fr. smooth.

11. NEGUNDO. BOX ELDER, ASH-LEAVED MAPLE.

14. *N. aceroides*, Mœnch.; Box Elder. Tree 25°-50° high; wood light, soft; lvs. ternate, and 5-7-pinnate, terminal lft. largest.

(Order Anacardiaceæ.)

12. RHUS. SUMACH.

15. *R. copallina*, L.; Dwarf Sumac. A small tree or only a shrub. Lfts. 9-21, ovate-lanceolate, petioles winged between the lfts.; branches and petioles pubescent; fruit hairy.
16. *R. venenata*, L.; Poison Sumac, Poison Elder. A small tree, lfts. 7-13, ovate-oblong, petioles wingless; fr. glabrous, whitish, smooth. Whole plant poisonous to taste or touch.

(Order Leguminosæ.)

13. ROBINIA. LOCUST.

17. *R. Pseudacacia*, L.; Black Locust, Yellow Locust. Small or medium-sized tree; prickly or spiny; wood heavy, hard; lfts. 6-12 pairs; fls. fragrant, showy, in numerous pendulous clusters; pod 4'-5' long.

14. GYMOCADUS. COFFEE-TREE.

18. *G. Canadensis*, Lam.; Kentucky Coffee-Tree. A large tree; wood strong and heavy, but not hard; branches naked; lvs. very large, bi-pinnate; pods containing several brown, hard, polished seeds.

15. GLEDITSCHIA. HONEY LOCUST.

19. *G. triacanthos*, L.; Black, Sweet, or Honey Locust. A large tree, with strong, heavy, hard wood; branches armed with stout, triple or branched thorns; pods flat, often twisted.

16. CERCIS. RED-BUD.

20. *C. Canadensis*, L.; Red-bud, Judas tree. Small tree, with hard, heavy, but not strong wood. Lvs. broadly ovate-cordate, entire, acuminate, smooth, but villous on the veins beneath; showy red flowers preceding the leaves.

(Order Rosaceæ.)

17. PRUNUS.* PLUM OR CHERRY.

21. *P. Americana*, Marsh.; Wild or Canada Plum. A small, thorny tree; wood heavy, hard, strong; lvs. conspicuously pointed, ovate or somewhat obovate, coarsely or doubly serrate, very veiny; flowers in early spring.
22. *P. angustifolia*, Marsh.; Hog Plum, Chicasaw Plum. A small tree or low shrub, scarcely thorny; wood heavy, soft, not strong; lvs. nearly lanceolate, acute, finely serrulate; flowers in early spring.
23. *P. serotina*, Ehrh.; Wild Black Cherry. Large tree, branches reddish-brown; wood light, hard, strong; lvs. oblong, taper-pointed, serrate, with incurved, callous teeth; fls. in racemes, late in spring; fr. purplish black.

18. PYRUS. APPLE.

24. *P. coronaria*, L.; American Crab Apple. A small tree; lvs. ovate, somewhat cordate at base, cut-serrate, or lobed; fls. handsome, fragrant; fr. greenish.

19. CRATEGUS. THORN.

Lvs. with a tapering base, and cut or serrate above the middle (a).

Lvs. toothed, cut or cut-lobed (b).

a. Lvs. shining above, serrate toward the apex (25).

a. Lvs. dull, unequally toothed above (28).

b. Glabrous; lvs. thin, usually abrupt at base (26).

b. Pubescent; lvs. thickish; petioles slightly margined (27).

**P. Virginiana* L., Choke Cherry, with lvs. oval, oblong or obovate, abruptly pointed, very sharply serrate with slender teeth, and fr. red turning to dark crimson, though excluded by Prof. Sargent, is sometimes arborescent with us.

25. *C. crus-galli*, L.; Cockspur Thorn. Twigs, etc., glabrous; lvs. thick, dark green, shining above, cuneate, obovate or oblanceolate, serrate above the middle; petioles short; fr. globular, bright red; thorns straight and slender, 2'-3' long. June.
26. *C. coccinea*, L.; Scarlet Haw, White Thorn, Red Haw. Twigs, etc., glabrous; lvs. thin, roundish-ovate, toothed and cut or lobed; petioles slender; fr. bright coral-red, ovoid. May.
27. *C. tomentosa*, L.; Black Thorn, Pear Haw. Pubescent (at least when young) on peduncles, calyx, and lower surface of leaves; lvs. thickish, oval or ovate-oblong, toothed and cut, narrowed at base into a somewhat margined petiole; fr. scarlet or orange, globular or pyroid.
28. *C. tomentosa*, L. var. *punctata*, Gray.—Like the last but with lvs. wedge-obovate, with a longer tapering base, unequally toothed above, rarely cut; fruit globose.

20. AMELANCHIER. SERVICE BERRY.

9. *A. Canadensis*, T. & G.; June Berry, Service Berry. A small tree, wood heavy, very strong. Lvs. sharply serrate, oval, or oblong-ovate, often cordate at base, acuminate or mucronate, smooth; fls. white in early spring; fr. edible, ripe in June.

(Order Sapotaceae.)

21. BUMELIA.

30. *B. lanuginosa*, Pers.; Gumelastic, Shittim-Wood. Shrub or tree; wood heavy, soft, weak; pedicels, calyx, and lower surface of lvs. tomentose pubescent. Lvs. oblong-obovate or cuneate-obovate.
31. *B. lycioides*, Gærtn.; Southern Buckthorn. Shrub or low tree; wood heavy, hard, not strong; pedicels and calyx glabrous and lvs. nearly so. Lvs. oblanceolate or obovate-oblong, sometimes ovate lanceolate.

(Order Ebenaceae.)

22. DIOSPYROS. PERSIMMON.

32. *D. Virginiana*, L.; Persimmon. A tree 20°-60° high; wood hard, blackish; lvs. ovate-oblong, nearly smooth, thickish; fr. plum-like, edible when ripe, very astringent when green.

(Order Oleaceae.)

23. FRAXINUS. ASH.

Branchlets and petioles glabrous, or glabrous throughout (*a*).

Branchlets and petioles velvety pubescent (*34*).

a. Lvs. entire, or obscurely subserrate (*33*).

a. Lvs. serrate (*b*).

b. Vigorous branchlets square; lfts. 7-9; fr. lin.-oblong or cuneate-oblong (*36*).

b. Branchlets terete; lfts. 5-9; fr. tapering from summit to base (*35*).

33. *F. Americana*, L.; White Ash. A large tree; wood heavy, hard, strong, ultimately brittle; branchlets and petioles glabrous; lfts. 7-9, ovate to oblong-lanceolate, pale or whitish beneath. Fr. 1½' long; body of fr. completely terete.
34. *F. pubescens*, Lam.; Red Ash. Tree middle-size or large; wood heavy, hard, strong and brittle, coarse-grained, young parts velvety pubescent. Lfts. mostly 5, ovate or oval, 1½'-2' long; fr. 1½'-2' long, its body more or less margined upward.
35. *F. viridis*, Mx.; Green Ash. Small or middle-sized tree; glabrous; wood heavy, hard, strong, brittle; lfts. 5-9, bright-green, oblong-lanceolate to ovate; fruit 1'-1½' long; its body more or less margined upward.

36. *F. quadrangulata*, Mx.; Blue Ash. A large tree; wood heavy, hard, not strong, brittle; lfts. 7-9, ovate-oblong to lanceolate, sharply serrate, 3' or 4' long, fr. 1'-2' long, with a wing-margined body.

(Order Bignoniaceæ.)

24. CATALPA.

37. *C. bignonioides*, Walter; Catalpa, Bean Tree. Lvs. cordate, pointed, downy beneath, disagreeable (almost fetid) when touched; fls. showy, white, tinged with violet, dotted in the throat with yellow and purple, lower lobe of corolla entire; pod 8'-10' long, 9-12 lines in circumference, width of seeds $2\frac{1}{2}$ -3 lines.
38. *C. speciosa*, Warder; Western Catalpa. Lvs. truncate or subcordate at base, slenderly acuminate, soft downy beneath, inodorous; flowers larger than in the preceding, but lower lobe of corolla deeply notched or bi-lobed; pod terete, 8'-20' long and 17-20 lines in circumference, width of seeds $3\frac{1}{2}$ -4 lines.

(Order Lauraceæ.)

25. SASSAFRAS.

39. *S. officinale*, Nees.; Sassafras. Tree 15°-50° high, twigs yellowish green; lvs. ovate entire, or some of them 3-lobed, bark spicy; twigs and foliage mucilaginous.

(Order Urticaceæ.)

26. ULMUS. ELM.

Lvs. very rough above (40.)

Lvs. smooth above, or nearly so (a.)

a. Branches corky-winged; lvs. 1'-2½' long (42.)

a. Branches not corky; lvs. 2'-4' long (41.)

40. *U. fulva*, Mx.; Red Elm, Slippery Elm. Tree 40°-60° high; wood heavy, hard, strong, close-grained, reddish, inner bark mucilaginous; buds soft, downy, with rusty hairs; lvs. 4'-8' long, very rough above; fruit not ciliate.
41. *U. Americana*, L.; White Elm, American Elm, Water Elm. A large tree; wood hard, strong, tough, rather coarse-grained, branches not corky; lvs. 2'-4' long, abruptly pointed, pubescent, or soon glabrous beneath; branchlets drooping. Fls. in fascicles; fruit fringed-ciliate, otherwise glabrous.
42. *U. alata*, Mx.; Winged Elm, Wahoo. A small tree (about 20°-40° high,) wood hard, not strong, very close-grained. Branchlets nearly glabrous, some of them corky-winged; lvs. 1'-2½' long, acute, downy beneath; fls. in racemes; fr. fringed-ciliate, downy on the face (when young.)

27. CELTIS. HACKBERRY.

43. *C. occidentalis*, L.; Hackberry, Sugar Berry, Nettle Tree. Tree 50°-70° high; bark rough, the furrows discontinuous; wood rather soft, coarse-grained; lvs. ovate, cordate-ovate and ovate-lanceolate, *reticulated*, *veinlets* prominent; fls. appearing with the lvs.; fr. edible.

28. MORUS. MULBERRY.

44. *M. rubra*, L.; Red Mulberry. A large tree; wood light, soft, rather tough, coarse-grained; lvs. heart-shaped, serrate, rough above, lobed on young shoots; fr. blackberry-like.

29. MACLURA. OSAGE ORANGE.

45. *M. aurantiaca*, Nutt; Osage Orange, Bois d'Arc. A tree 25°-60° high; wood heavy, very hard and strong; lvs. shining above, obscurely denticulate; spines stout, axillary; fr. orange-like in appearance.

(Order Platanaceæ.)

30. PLATANUS. SYCAMORE.

46. *P. occidentalis*, L.; Sycamore, Buttonwood. A large tree; wood light, soft, close-grained; bark (at least of branches) white, detached annually in thin plates; lvs. mostly truncate at base, sinuate-lobed or toothed.

(Order Juglandaceæ.)

31. JUGLANS. WALNUT.

47. *J. cinerea*, L.; Butternut, White Walnut. 50°–100° high; wood light, soft; lfts. 15–17, oblong-lanceolate; fr. oblong, clammy, pointed; the nut deeply sculptured and rough, with ragged ridges.
48. *J. nigra*, L.; Black Walnut. 90°–140° high; wood heavy, hard; lfts. 15–21, ovate-lanceolate; fr. spherical, roughly dotted, nut corrugated.

32. CARYA. HICKORY.

- Lfts. 13–15, scythe-shaped; nut oblong, thin-shelled, sweet (49).
 Lfts. 7–11; nut with a tender shell and bitter kernel (a).
 Lfts. 5–9; nut roundish, hard-shelled, sweet (b).
- a. Lfts. sharply serrate; nut globular, white; lvs. nearly smooth (54).
 a. Lfts. subentire; nut angular, reddish; lvs. shining green both sides (55).
 b. Valves of the epicarp distinct to the base; bark with loose plates (c).
 b. Valves of the epicarp united below; bark continuous, firm (d).
- c. Lfts. 5; shell thin (50).
 c. Lfts. 7–9; shell very thick (51).
 d. Lfts. 7–9, obscurely-serrate or entire, rough downy beneath (52).
 d. Lfts. 5–7, serrate, nearly glabrous (53).
49. *C. olivæformis*, Nutt.; Pecan-nut. 90°–160° high; wood heavy, hard, brittle; lfts. oblong-lanceolate, 13–15, serrate, scythe-shaped. Nut thin-shelled, olive-shaped.
50. *C. alba*, Nutt.; Shagbark or Shellbark Hickory. 60°–140° high; bark exfoliating, that is, shaggy; wood heavy, hard, strong, tough; lfts. 5, lower pair much smaller; nut white; flattish-globular, shell thinnish.
51. *C. sulcata*, Nutt.; Big Shellbark. 60°–95° high; bark shaggy; wood heavy, hard, strong and tough; lfts. 7–9, downy underneath; fr. oval or ovate, 4-ribbed above the middle; husk very thick; nut large (1½'–2' long), dull white, thick-walled.
52. *C. tomentosa*, Nutt.; Black Hickory, Bull-nut, King-nut. Bark close, rough, but not shaggy; wood very hard, heavy, strong, tough; shoots tomentose when young. Lfts. 7–9, lance-obovate. Husk very thick and hard; nut 4-ridged towards the summit, brownish; 1' in diameter, or smaller.
53. *C. porcina*, Nutt.; Pignut, Black Hickory. Large tree; bark not exfoliating; wood heavy, hard, very strong; lfts. 5–7, serrate, nearly glabrous; nut oblong or oval, 1½'–2' long; shell bony, thick.
54. *C. amara*, Nutt.; Bitter-nut, Swamp Hickory. 50°–80° high; bark not exfoliating; wood heavy, hard, tough; shoots and lvs. more or less pubescent, becoming almost glabrous. Lfts. 7–11, oblong-lanceolate, or lanceolate; fr. globular, 6-ridged; nut white, bitter, thin-walled, barely 1' long.
55. *C. aquatica*, Nutt.; Water Hickory, Bitter Pecan. 50°–65° high; wood heavy, soft, strong, rather brittle. Lfts. about 11, lanceolate, almost entire, shining green on both sides; nut small, reddish, shell very tender, kernel bitter.

(Order Cupuliferae.)

33. QUERCUS. OAK.

Acorns on wood of the season; *i. e.*, perfected the first year (*a*).Acorns on wood of previous season; *i. e.*, perfected the second year (*f*).

- a.* Lvs. lyrate or pinnatifid (*b*).
 - a.* Lvs. coarsely toothed but not lobed (*e*).
 - b.* Lvs. wedge-shaped at base; fruiting peduncle much longer than petiole (59).
 - b.* Lvs., etc., not as above (*e*).
 - c.* Cup deep, scales pointed, upper ones awned, mostly mossy-bordered (58).
 - c.* Cup hemispherical or saucer-shaped, not mossy-fringed (*d*).
 - d.* Lvs. bright green above; cup rough or tubercled, much shorter than acorn (56).
 - d.* Lvs. pale and rough above; cup not tubercled, $\frac{1}{3}$ or $\frac{1}{2}$ length of acorn (57).
 - e.* Fruiting peduncle longer than petiole, lvs. wedge-shaped at base (59).
 - e.* Fruiting peduncle shorter than petiole, lvs. obtuse at base (60).
 - f.* Lvs. entire, lance-oblong, shining above, downy underneath (65).
 - f.* Lvs. widening above, 3 or 5-lobed, sometimes with one or two lateral, bristle-tipped teeth, rusty beneath, shining above, 4'-9' long (63).
 - f.* Lvs. pinnatifid or lobed, not coriaceous, teeth or lobes bristle-pointed (*g*).
 - g.* Cup saucer-shaped, very much shorter than the acorn (*h*).
 - g.* Cup hemispherical, with a conical base, half covering the acorn (62).
 - h.* Cup 9-12 lines broad; acorn 1' or less long; lvs. rarely deeply pinnatifid (61).
 - h.* Cup 5-7 lines broad; acorn 5-7 lines long; lvs. deeply pinnatifid, lobes divergent (64).
56. *Q. alba*, L.; White Oak. A large tree; wood strong, very heavy, hard, tough, brown in color; mature lvs. smooth, pale or glaucous beneath, bright green above, obovate-oblong, 3-9 obtuse lobes; cup saucer-shaped, rough, much shorter than the acorn, which is ovoid or oblong, and about 1' long.
57. *Q. obtusiloba*, Mx.; Post Oak, Iron Oak. Rarely exceeding 75 feet in height; wood heavy, hard; lvs. grayish or yellowish downy beneath, pale and rough above, 5-7 rounded, divergent lobes; cup deep, saucer-shaped, smooth, $\frac{1}{3}$ or $\frac{1}{2}$ the length of the acorn, which is ovoid, and 6-9 lines long.
58. *Q. macrocarpa*, Mx.; Burr Oak. A large tree; wood heavy, hard, strong, tough; lvs. obovate or oblong, lyrate or deeply sinuate-lobed, or nearly parted; downy or pale beneath; cup deep, thick, scales pointed, upper ones awned and "mossy;" acorn half or entirely immersed in the cup, broadly ovoid, 1'-1 $\frac{1}{2}$ ' long.
59. *Q. bicolor*, Willd.; Swamp White Oak. A large tree; wood heavy, hard, strong, tough; lvs. obovate or oblong-obovate, cuneate at base, coarsely sinuate-crenate, soft, downy and hoary beneath, main primary veins 6-8 pairs; fruiting peduncle much longer than the petiole; cup hemispherical, half the length of acorn, which is scarcely 1' long; scales pointed, sometimes "mossy."
60. *Q. prinoides*, Willd.; Yellow Oak, Chinquapin Oak. A large tree, or reduced to a shrub; wood heavy, hard, very strong; lvs. oblong or lanceolate, undulately sharp, crenate-toothed, minutely downy beneath; the main primary veins 10-16 pairs; fruiting peduncles shorter than the petioles; cup hemispherical, thin; acorn 7-9 lines long.
61. *Q. rubra*, L.; Red Oak, Black Oak. A large tree; wood heavy, hard, strong; lvs. glabrous, or nearly so, rather thin, oval or obovate-oblong, (rarely deeply) pinnatifid, lobes rather acute; cup saucer-shaped or flat, with a narrow raised border, 9-12 lines in diameter, very much shorter than the oblong-ovoid, 1'-long acorn.

62. *Q. tinctoria*, Bartram; Black, Yellow, or Quercitron Oak. A large tree; wood heavy, hard, strong, not tough, coarse-grained. Lvs. glabrous or nearly so (pubescent beneath when young), oval or obovate-oblong, lobes oblong, obtuse, mucronate. Cup thick, 9 lines in diameter, covering half the acorn, which is broadly or globular-ovoid.
63. *Q. nigra*, L.; Black Jack, Jack Oak. A small tree; wood heavy, hard, strong. Lvs. broadly wedge-shaped (sometimes rounded at base), widely dilated and 3 (rarely 5) lobed at summit; rusty pubescent beneath, shining above; cup top-shaped; acorn short ovoid.
64. *Q. palustris*, Du Roi.; Pin Oak, Water Oak. A large or middle-sized tree; wood heavy, hard, very strong, coarse-grained. Lvs. glabrous or nearly so, oval or oblong-obovate, deeply pinnatifid with divergent lobes and broad, rounded sinuses; cup flat, saucer-shaped, very much shorter than the acorn, which is ovoid-globose, 5-7 lines long.
65. *Q. imbricaria*, Mx.; Shingle Oak, Laurel Oak. A large tree; wood heavy, hard, rather coarse-grained. Lvs. lanceolate-oblong, thickish, shining above, downy beneath; cup between saucer-shaped and top-shaped.

34. OSTRYA. IRON-WOOD.

66. *O. Virginiana*, Mich.; Hop Horn-beam, Iron-wood. A small tree; bark brownish, furrowed with fine longitudinal divisions; wood heavy, very strong and hard, tough; lvs. serrate, 11-15 prominent veins; fr. hop-like in appearance.

35. CARPINUS. WATER BEECH.

67. *C. Caroliniana*, Walter; Horn-beam, Blue Beech, Water Beech. A small tree; bark smooth, close, gray; wood heavy, very strong and hard; lvs. straight-veined, resembling the beech; fr. catkin-like, loose, the bractlets open and foliaceous.

(Order Betulaceæ.)

36. BETULA. BIRCH.

68. *B. nigra*, Ait.; Red Birch. A large tree, with greenish-brown bark, somewhat laminate, becoming torn into shreds; wood light, rather hard, strong, coarse-grained; branchlets often clothing the trunk to the base; lvs. rhombic-ovate, acute at each end, dark green above, pubescent.

(Order Salicaceæ.)

37. SALIX. WILLOW.

69. *S. nigra*, Marsh.; Black Willow. A shrub or small tree, sometimes 60 ft. high; lvs. narrowly lanceolate; smooth, except on petioles and midrib; green both sides; branches brittle, pale yellow; trunk with blackish bark. Catkins on lateral leafy branches of the season; stamens 3-6; pods mostly short, ovate.
70. *S. longifolia*, Muhl.; Longleaved Willow. Shrubby or 15°-20° high; lvs. linear or lanceolate, elongated, long acuminate, remotely toothed with projecting teeth, catkins on short lateral leafy branches; stamens 2; pods oblong-conical, obtuse.
71. *S. discolor*, Muhl.; Glaucous Willow. Rarely more than 20° high; lvs. lanceolate, ovate-lanceolate or oblong, entire at the base and apex, irregularly toothed on the sides, smooth, whitish glaucous beneath, catkins appearing before the leaves; stamens 2; ovary densely silky.
72. *S. cordata*, Muhl. var. *vestita*, Anders.; Heart-leaved Willow. A straggling shrub or small tree, recent twigs tomentose; lvs. linear-lanceolate or oblong-lanceo-

late, or on vigorous shoots broadly-lanceolate, glandular serrate, sharply toothed, smooth, veinlets reticulated and pale beneath; the sessile aments precede the leaves; stamens 2; pods long pedicelled.

38. POPULUS. POPLAR.

73. *P. monilifera*, Ait.; Cottonwood, Necklace Poplar. A large tree; wood very light, soft, not strong; lvs. broadly deltoid, prominent nerves, pointed, serrate with cartilaginous, incurved, slightly hairy, teeth.

(Order Coniferae.)

39. JUNIPERUS. JUNIPER.

74. *J. Virginiana*, L. Red Cedar, Savin. Scale-shaped lvs. acute or acutish; wood light, soft, odorous, dull red. Fr. a small, bluish berry.

40. PINUS. PINE.

75. *P. mitis*, Mx. Yellow Pine, Spruce Pine. A tree 75°-80° high; wood heavy, hard, strong, mostly coarse-grained. Lvs. in twos or threes, from long sheaths, slender, 3'-5' long, cones ovate or oblong conical, scales tipped with a minute prickle.

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THE SKY.¹

BY EDWARD L. NICHOLS, OF THE UNIVERSITY OF KANSAS.

Nothing in nature has impressed man more profoundly than the sky. Poet, painter, and philosopher, ancient and modern, each in his own way has striven to express its beauties. The ancient idea of the sky was that of an adamantine dome or vault upon which stars were studded, within which sun, moon, and planets moved. Upon Egyptian, Greek, and Roman, for whom the idea of an atmosphere as we now understand it did not exist, to whom the infinities of space were entirely closed, for whom there was no such thing as aerial perspective, the subtler beauties were lost. Yet from the earliest times the color of the sky drew the attention and admiration of all men, and expressions for it began to find their way into language and literature at a day when the color-sense, as we now know it, was largely undeveloped.²

The modern idea supplanted the old when the conception of an atmosphere became well established, and when modern astronomy had begun to give proper notions of the enormous distances and true motions of the heavenly orbs. The development

¹ Address of the retiring President. Delivered November 28, 1886, at the Emporia meeting of the Kansas Academy of Science.

² See Gladstone, *Nineteenth Century*, 1877, p. 367.